PRMEL

INSTRUCTION MANUAL

FOR

REGATRON MODEL 209-B

ELECTRONIC MEASUREMENTS COMPANY, INC.

EATONTOWN NEW JERSEY

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LEWIS STREET AND MAPLE AVENUE
EATONTOWN, NEW JERSEY
TELEPHONE--EATONTOWN 3-0300

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REGATRON MODEL 209-B SPECIFICATIONS

Output Voltages:
1. 0 to 600 V. D.C. at 600 ma; 60 ma. as a voltage standard.
2. 0 to 150 V. D.C. at 5 ma.
3. 6.3 V. A.C. at 10 amps center-tapped, unregulated.

Regulation Factor:
0 to 600 V. output: Within 20 mv. no load to full load; within 5 mv. as a voltage standard. Within 50 mv. or 0.05% for line from 105 to 125 V.
0 to 150 V. output: VR regulated with 50,000 ohm pot for control; 1/2% load regulation; immune to line variations.

Hum Voltage:
0 to 600 V. output: Within 500 microvolts up to 100 V., or within 1 mv. up to 600 V. Within 500 uV as voltage standard.
0 to 150 V. output: Within 1 mv.

Stability:

0 to 600 V. output: ± .1% or .1 V. after warm-up.
0 to 150 V. output: That of an OA2 VR tube at fixed current, (for a given load.)

Calibration:
0.25% or 0.25 V.

Modulation:
Input Impedance: 200 ohms.
Gain: 0.5
Capability: D.C. - ± 15 V. 20 cps - 10 V., full load; 0.5 V. no load. 1,000 cps - 1 V., full load; 10 mv., no load.

Line Input:
105 to 125 V. A.C., 50 to 60~.

Power Consumption:
Approx. 700 watts at full load.

Meters:
Voltmeter: 600 V. or 150 V. full scale; minus 150 V. full scale for bias.
Milliammeter: 600 ma. full scale.

Electrical Vernier:
0 to 3 V., usable anywhere in range of high voltage.

Output Terminations:
All outputs at front binding posts, with reversible ground. Positive of 150 V. output permanently connected to negative of 600 V. output.

Overload Protection:
Line and high voltage supply fused. Time delay relay included.

Finish:
Gray wrinkle with machine engraved designations.

Mounting:
Table or relay rack; carrying handles included.

Dimensions:
Panel: 10-1/2" x 19".
Overall: 10-1/2" x 19" x 15"

Weight:
Approximately 80 pounds.

I. GENERAL

1. INSPECTION:

The unit may be opened for inspection by removing the four screws on the rear of the cover and sliding it backwards. After unpackaging the unit, inspect the tubes to see that they are securely in their sockets. When this unit is first turned on after shipment, or after a long period of idleness, it should be allowed to warm-up for about one hour, before applying high voltage.

2. USE AS A VOLTAGE STANDARD:

This unit may be employed to supply calibrated voltages from zero to 600 volts; however, when so used the current supplied to a load should not exceed 60 milliamperes. Calibration applies for an electrical vernier setting of zero. If the unit has been operated for some time as a source of power at high current, and it is desired to employ the unit as a source of standard voltage, the load should be completely removed for a period of from 15 to 20 minutes so that the internal fan can reduce and stabilize the temperature. The calibration of this unit is performed at an ambient temperature of 21°C (70°F). The change due to temperature is approximately 0.0045% per degree centigrade.

3. USE AS A POWER SOURCE:

When used as a power source at high currents, the calibration is still useful at somewhat reduced precision. The cabinet should not be placed in a location completely closing or blocking the ventilation openings, particularly at the fan intake. If mounted in a rack, this consideration should be kept in mind.

II. OPERATION

WARNING!

High voltages appear at the output terminals and at various points within the unit. In operation, great care should be observed to avoid accidental contact with any exposed load connections or leads. Load connections should be made with the power OFF!

1. PRELIMINARY:

To operate this unit, proceed as follows:

(a) Place the switches and controls in the following positions:

1. Line switch - off (down).

2. High voltage switch - off (down).

3. H.V. control - minimum (maximum counterclockwise).

4. Electrical vernier - zero.

5. Bias control - minimum (maximum counterclockwise).

6. Meter switch - plus 600.

(b) Make load connections to the binding posts at the front of the unit. The grounded post should securely compress the connecting device or lead as well as the grounding link.

NOTE

The regulation of this unit is measured at the binding posts; in use, the load leads should be made heavy enough to reduce the drop to acceptable limits.

(c) Plug the line cord into an outlet providing 115 volts A.C. at 50 to 60 cycles. Operate the line switch to the on position (green indicator will glow). A time delay relay is provided in this unit to permit adequate tube warm-up. The delay period is approximately one minute.

(d) Apply voltage to the load by operating the H.V. Switch to the on position (up). This will be indicated by the red indicator light.

WARNING!

This light comes on when the switch is turned on, even if the delay period is incomplete, to indicate that high voltage may come on at any time. Caution should be observed whenever this switch is on.

2. ADJUSTMENT OF VOLTAGES:

2.1 Bias: The bias may be read by operating the meter switch to the minus 150 position. Bias may then be adjusted with the panel control from zero to 150 volts.

NOTE

Bias is not turned off by the H.V. Switch.

2.2 High Voltage: The high voltage control covers the range from zero to 600 volts in ten turns, providing 60 volts per turn. To determine the correct output voltage, it is necessary to know the last multiple of 60 swept by the dial. To make this possible, the voltmeter has cardinal markings every 10% from zero to 600 volts. Thus, by noting the increments between which the reading lies, and adding the dial reading to the last previous multiple of 60, the total reading is determined.

Example: Voltmeter reading between 240 and 300.
Dial reading 25.5.
Output voltage = 240 + 25.5 = 265.5

2.3 Vernier Control: The calibration applies with the vernier control set at zero. When the vernier is operated to any value between zero and 3 volts, the indicated voltage is added to the output voltage at any point in the range.

3. REVERSAL OF POLARITY:

This power unit has been designed so that either side of the high voltage may be grounded to the case as desired. The unit is normally supplied with the negative side grounded. To reverse polarity, loosen the three high voltage binding posts, move the link to the other post, and retighten the two posts on the link. Load connection for the ground side may be inserted either under the ground post or the ground terminal.

WARNING!

For safety, always be sure that the case or ground of external equipment is connected to the grounded side of the power circuit.

The high voltage may be operated with neither side grounded provided the potential between this supply and the case is kept low.

4. MODULATION:

The output voltage may be offset by a D.C. signal, or alternatively modulated by an A.C. signal by inserting the appropriate voltage into the MOD post. The other side of the modulating source should be returned to the small ground post adjacent to the MOD post.

NOTE

When the positive terminal of the high voltage is grounded the MOD post carries the negative high voltage. Hence a blocking capacitor will be required. This blocking capacitor should be of sufficient size to pass the desired modulating frequency and of sufficient voltage rating to withstand the negative high voltage. In selecting this capacitor, bear in mind that the input resistance is 200 ohms.

Modulation may also be applied between the MOD posts and the negative terminal of the high voltage; however, with positive grounding this will elevate the modulating source to negative high voltage.

III. MAINTENANCE

1. REPLACEMENTS:

When replacements are required, any parts may be used of the values and tolerances indicated on the circuit diagram with the exception of the items listed below. Appropriate directions are given in each case.

1.1 V5, 12AX7, V11, OB2.

Changing either of these tubes may effect the zero balance so it should be checked in accordance with instructions above.

1.2 V10, 5651.

Changing this tube may effect the reference voltage. Accordingly, if a source of standard voltage is available, the reference adjustment should be reset.

1.3 Multi-turn potentiometer:

If this potentiometer develops a fault, it is recommended that advice be sought from the factory. After consideration of the facts involved, shipping and other instructions will be forwarded.

1.4 Resistors RW1, RW2, RW3, RW4, RW5, RW6.

If any of these become defective, obtain replacement parts from the factory. Give the serial number of the instrument.

2. SERIES TUBES:

If, at any time, it is believed that one or more series tubes and associated circuits are faulty, this may be checked as follows:

(a) Remove all series tubes but one.

(b) Turn the equipment on and apply a load of 200 ma. at some low voltage. Check ripple and regulation.

(c) Remove this series tube and place another series tube in another socket and repeat (b).

(d) Repeat (b) for every other socket and tube, taking one at a time.

(e) If one or more of the circuits shows faulty, repeat the test in each case using a tube known to be good.

(f) If a favorable result is obtained, it may be taken that the previous tube is faulty. If not, the associated circuits should be checked for faults.

3. CALIBRATION:

Three calibrating adjustments are provided on the chassis of this unit as follows:

3.1 Zero adjustment.

The zero adjustment is used to set the input comparator system to a zero level, which then holds over the entire operating range. This control may be found to the right of the variac just behind the front panel (looking from front). To set this adjustment, proceed as follows:

(a) Rotate the H.V. and electrical vernier controls to zero.

(b) Connect a voltmeter to the high voltage output terminals (full scale sensitivity 3 volts D.C. or less).

(c) [illegible] zero. A very sensitive indication may be obtained by alternately connecting and disconnecting the voltmeter lead.

3.2 Calibration.

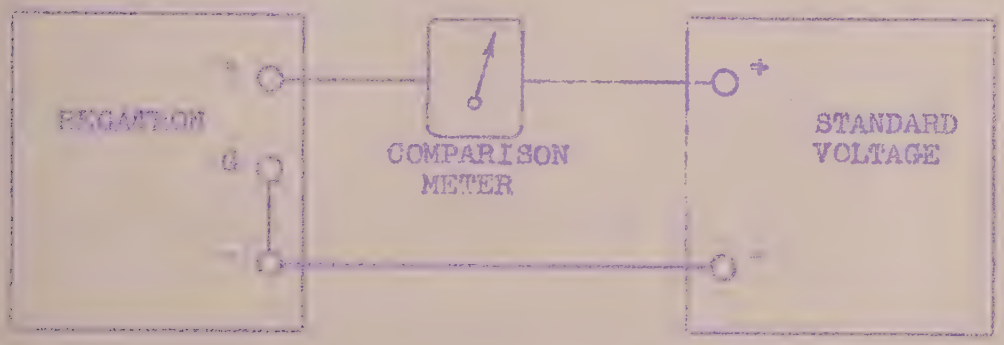
The calibration adjustment should not be moved [illegible] is available in the range from 200 to 600 volts. The preferred calibrating voltage is 300 volts, if available. To calibrate, proceed as follows:

(a) Connect the power unit to the measuring device.

(b) Set the high voltage control to the calibrating voltage.

(c) Adjust the calibrating control to read correctly.

If a source of [illegible] voltage is available, make connections as indicated below:



The comparison meter should have a full scale sensitivity of 3 volts or less but should be set to a relatively insensitive range to begin calibration. Then proceed as follows:

(a) Set the output voltage of the REGATRON to the calibrating potential.

(b) Increase the sensitivity of the voltmeter until an on-scale reading is obtained.

(c) Bring the reading to zero using the calibration control.

3.3 Reference adjustment

A reference voltage of minus 300 volts (measured with negative ground on the H.V.) is employed in this unit. It may be calibrated as above using the reference adjustment. The reference voltage is available at the bottom of the reference unit on the exposed bus marked with red paint. The reference sub-assembly is at the left of the chassis (from top front).

IV. USE AS A COMPARISON VOLTMETER

Because of its calibration, this power unit may be employed as a comparison voltmeter. To do this, set up connections as indicated below and proceed as follows:

(a) With the indicating meter set on the least sensitive range, rotate the high voltage control to reduce the reading.

(b) Progressively increase the sensitivity of the voltmeter and reduce the difference as above.

(c) When the difference has been reduced to zero, read the voltage from the calibrated dial as described elsewhere.

V. TRANSISTOR APPLICATIONS

1. RESOLUTION:

Because of the high resolution of the ten turn potentiometer, the lower voltages normally employed in transistor work can easily be set. Where still higher resolution is desired, the ten turn control may be used for a coarse setting and the electrical vernier for fine setting. For voltages of less than 3 volts, the electrical vernier alone may be used, with the main control set at zero.

2. SMALL SIGNAL MEASUREMENTS:

One method for the measurement of transistor parameters requires the superposition of a small A.C. signal on one of the D.C. potentials. This unit is particularly suitable for this since the D.C. voltage may be set independently, and modulation then introduced to provide the required small signal (subject to the instructions given above). In this connection it should be noted that more modulation is available as the load current is increased (due to the reduced time constant of the output system). Accordingly, where the available modulation is insufficient at loads less than maximum, some additional D.C. load may be added to permit greater modulation.

VI. BRIDGE MEASUREMENTS

As described for transistor applications, this unit may be used to provide separately adjustable A.C. and D.C. excitation for bridges, strain gauges, etc.

WARRANTY

Our instruments are guaranteed to be free from defects in material and workmanship for one year from the date of purchase (except for tubes, fuses and batteries). Our liability under this warranty is limited to repairs and adjustments or replacements of defective parts or instruments when the fault is a direct result of defective materials or workmanship in the manufacture of the apparatus. This warranty covers service for the first year, except for transportation to and from the factory.

If, during subsequent services, any fault develops in the equipment, the following steps should be taken:

1. Notify us, giving full particulars of the difficulty and include the serial number of the instrument in question. On receipt of this information, we will give you service information and/or shipping instructions.

2. On receipt of shipping instructions, forward the apparatus to us, prepaid, and we will make repairs and adjustments immediately at the factory.

3. If the fault has been caused by misuse, or abnormal conditions of operation, as disclosed by our examination, repairs will be billed at cost. In this case, an estimate of the cost will be submitted before the work is started.

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. When referring to this instrument, always include the model and serial numbers.

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